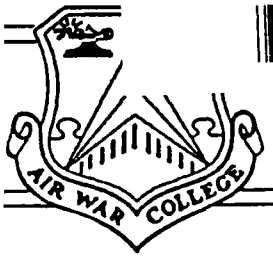


# AIR WAR COLLEGE

# Research Report

## DEVELOPMENTAL STRATEGY FOR UNITED STATES SPACE POWER

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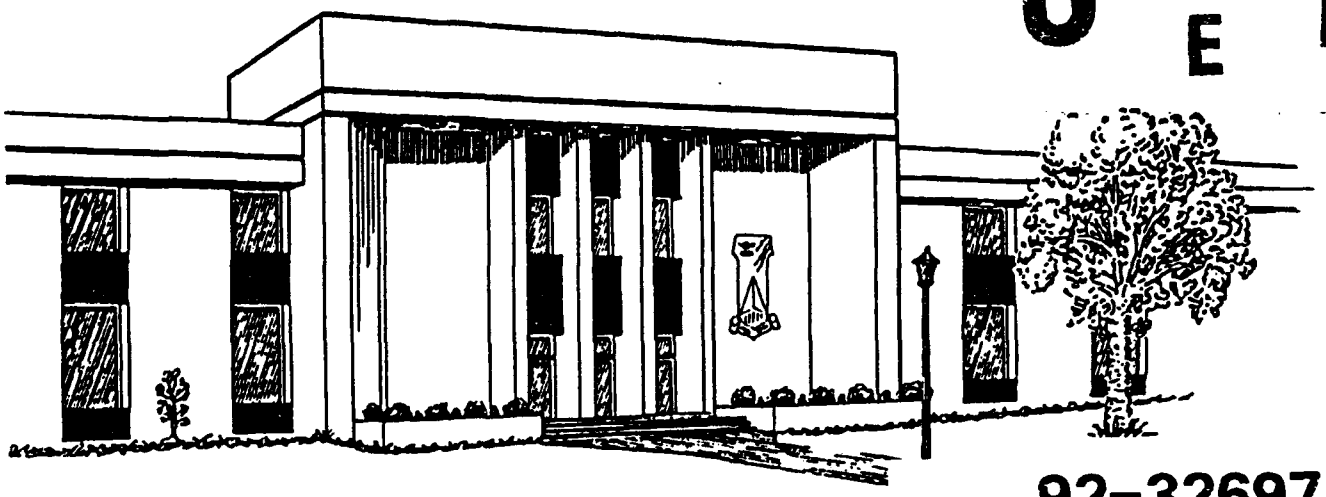
LIEUTENANT COLONEL, USAF

1992







Air University
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AIR WAR COLLEGE

AIR UNIVERSITY

# DEVELOPMENTAL STRATEGY FOR UNITED STATES SPACE POWER

by

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A RESEARCH REPORT SUBMITTED TO THE FACULTY

IN

FULFILLMENT OF THE CURRICULUM

REQUIREMENT

Advisor: Colonel John H. Harris, Jr

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## ABSTRACT

TITLE: Developmental Strategy for United States Space Power

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The demise of the Soviet Union as the major adversary of the United States has created an unusual challenge for senior military leaders. The Soviet threat has been a major justification for the development of military space capabilities that represent a large share of defense spending. The Desert Storm experience was a watershed for space power as military leaders discovered how dependent combat forces had become on space support. With a pressing need for budget reductions because of the national deficit, the perceived decline of the Soviet threat, and the increased dependence on space power, our leaders must convince taxpayers and Congress that developing space power is vital to our national security interests. To ensure that no scarce resources are wasted, a careful space force development strategy must be built to support our space force employment strategy. Many factors influence that strategy, and the strategy maker must understand their effects.

## BIOGRAPHICAL SKETCH

Lieutenant Colonel Roger B. Graves (B.A., Texas A&M University; M.A., Webster University) has been associated with missiles and space for most of his career. He served as a Titan II missile launch officer at Little Rock Air Force Base for 6 years and commanded the crew that launched the last operational Titan II Intercontinental Ballistic Missile from Vandenberg Air Force Base, California. After serving 2 years as a launch officer instructor with Air Training Command (ATC), he became an ATC training manager for the Ground Launched Cruise Missile and the Space Shuttle before joining the headquarters staff of the Air Force Space Command soon after it formed. As an operations training manager in Space Command, he became familiar with a variety of space systems. He served for a year as director of operations for Space Command's Cobra Dane Radar at Shemya Air Force Base, Alaska, then for 2 years as director of national warning systems instruction on the faculty of the Joint Command, Control, and Electronic Warfare School at Armed Forces Staff College in Norfolk, Virginia. Immediately prior to attending Air War College, he commanded the 9th Missile Warning Squadron at Robins Air Force Base, Georgia, one of Space Command's four large PAVE PAWS phased array radar sites. Colonel Graves has twice been awarded the Defense Meritorious Medal and four times the Meritorious Service Medal. He is a 1986 graduate of Air Command and Staff College and a 1992 graduate of the Air War College.

# DEVELOPMENTAL STRATEGY FOR UNITED STATES SPACE POWER

The demise of the Soviet Union as the major adversary of the United States has created an unusual challenge for senior military leaders. For several decades senior leaders have pointed to the Soviet threat as justification for developing and procuring major defense programs in a variety of mission areas. The development of military space assets has been one of the more significant in terms of budget and its impact on national defense. The impact of space assets on military operations has been so revolutionary that many now believe it is no longer possible to wage modern warfare effectively without them. Given this increase in dependency on space assets and the sudden and dramatic decrease in the threat used to justify them, the senior military leadership must clearly articulate to Congress and the American people the need to maintain sensible funding for space at a time when the budget deficit is also a highly visible threat to national security interests. The Department of Defense must ensure that appropriate assets are available to fulfill essential national security military requirements without undue jeopardy to other nonmilitary national security interests. This essay examines a variety of factors that will influence the strategy for development of a viable space power capability.

Before exploring the factors that affect space power strategy, it is important to understand what a strategy is and why we need one. The Air War College uses a definition of strategy expressed by Dr

William P. Snyder: "Military strategy is a broad concept which includes a military objective and a plan for achieving that objective by means of military resources." (12:49) Why do we need a strategy? To efficiently achieve objectives without wasting valuable resources. Given an objective, resources, and the will to accomplish it, a bureaucracy will consume those resources until the objective is achieved, the resources are exhausted, or the will to achieve it is lost. Poorly defined objectives with no clear plan for accomplishing them is a recipe for failure. According to Dr Snyder, there are two different categories of military strategy: operational and force developmental. The objective of operational military strategy might include defeating an enemy or deterring an attack. The objective of force developmental strategy would include development of weapons or forces to deal with existing or potential enemies. (12:51)

In their book Making Strategy, Colonel Dennis M. Drew and Dr Donald M. Snow divide military strategy into four distinct elements: force employment, force development, force deployment, and coordination. Force employment strategy determines where, against whom, and how military forces should be employed, and this plan depends primarily on the strategy maker's perception of the threat. Force development strategy concerns the quantity, quality, and nature of the resources required to pursue the force employment strategy. Each of these strategies influences the other. Force employment strategy determines what should be developed, and force development strategy determines what forces are available for employment. (7:81-85) Although this essay is concerned primarily with force

developmental strategy for space power, employment strategy is a key element in determining the kinds of space power assets that need to be developed.

With an understanding of what a strategy is, we can now explore the factors that shape a strategy. There are many, and each one impacts the others. For ease of discussion, these influences can be divided into four major sets of factors. The first category is doctrine. It pervades all aspects of strategy influences because it establishes the mental environment, the mental framework, the mental boundaries within which the strategy maker develops strategy. Second, national and organizational leadership influence the establishment of strategy objectives through a hierarchy of strategy documents, regulations, and policies. These formal, high-level documents provide a starting point for strategy development. Third, resources--both physical and intangible--greatly influence a strategy. This category includes budget, force structure, infrastructure, technology, national will, and allied support. The fourth category that dramatically affects strategy deals with environmental factors and constraints. These factors include the perception of the hostile threat and constraints imposed by the available quantity or quality of resources enumerated in the third category. All of these factors are so interdependent that a change to one ripples through the entire strategy framework. Because the space power arena is so dynamic, space power strategy is particularly difficult to develop and must be continuously reviewed to ensure the strategy is current.

The starting point for developing a strategy is doctrine. ccording to Drew and Snow, "Military doctrine is what we believe bout the best way to conduct military affairs." (7:163) They go on o identify three basic types of military doctrine: fundamental octrine that deals with basic concepts and rarely changes; nvironmental doctrine that deals with the exercise of military power n a particular medium such as space; and organizational doctrine hat deals with the use of a particular force in a particular nvironment at a particular time. (7:168-170)

Like strategy, several key factors influence doctrine. xperience is a primary source of doctrine, but we have had little xperience with space warfare. In the absence of experience, octrine must be based on theory. Our current military space assets ave been developed and deployed primarily in strategic roles. The trategic role is still vital, but the Desert Storm experience has ade it evident that more attention needs to be placed on developing pace systems to support tactical warfare. A program called Tactical xploitation of National Capabilities (TENCAP) has been established or the purpose of seeking ways to more efficiently use national pace assets in a tactical role.

Other important factors that affect doctrine (and therefore trategy) are international law and treaties, laws of physics, echnology, societal beliefs, and public opinion. For example, the aws of orbital mechanics greatly constrain the ways in which atellites can be deployed. A doctrine that proposed compensating

r physical constraints by placing nuclear weapons in orbit would olate a space treaty and societal beliefs, and public opinion would kely affect Congressional funding appropriations and ultimately rce structure.

In 1988, Lt Col David E. Lupton documented four schools of ought concerning space environmental doctrine in his book On Space rfare, A Space Power Doctrine. They include the following:

The Sanctuary Doctrine proponents believe weapons should never employed in space. Because of the Soviet Anti-Satellite (ASAT) apon, and other military uses of space, this school of thought has sentially become obsolete over the last few years.

The Survivability Doctrine (that would more appropriately have en called "the vulnerability doctrine") supporters maintain that tellites are inherently vulnerable to attack. This vulnerability uld lead to one of two strategies: either a retaliation-in-kind rategy or a denial strategy. Because technology continues to yield re and more advanced capabilities for survivability, this school of ought is no longer widely accepted.

The High Ground Doctrine followers assert that space is the timate strategic "high ground" and can be used to great advantage observation and defensive missions. It is based upon the old inciple that whoever controls the high ground can control the low ound. This school of thought is the basis for the Strategic

fense Initiative programs and systems supporting ballistic missile fense and theater missile defense such as Global Protection Against mited Strikes.

The Space Control School has emerged as one of the more dominant hools of doctrinal thought. Because our military has grown so pendent upon space assets for waging war, whoever controls space d can deny the use of space to an enemy gains a substantial vantage. The Soviet doctrine also subscribed to this school of ought. (9:--)

Air Force organizational doctrine is documented in Air Force nual 1-1, Basic Aerospace Doctrine of the United States Air Force. is document specifies the roles and typical associated missions of rospace forces. A typical mission of aerospace control (control of e combat environment) for space forces is counterspace. In the le of force application (application of combat power), the document sts no space-associated missions since the military has no space apons. Force enhancement (multiplying combat effectiveness) cludes missions of spacelift and surveillance and reconnaissance. rce support (sustaining forces) has an associated space mission of -orbit support. (1:6-7)

Other official publications document more specific space ctrine, particularly for operators and planners at lower echelons o are more closely associated with the operations and support of ace assets. These include Air Force Manual 2-25, Air Force

rational Doctrine: Space Operations; USSPACECOM Pamphlet 2-1. ted States Space Command: Doctrine for Space Control Forces; and nt Publication 3-14, Doctrine for Joint Space Operations. These uments elaborate on doctrinal principles for employing military ce assets.

By definition, doctrine is what we believe to be the best way to loy military force. Many doctrinal concepts begin as theory and n become validated and accepted through experience. Doctrinal ught should be unconstrained, limited only by imagination, for t is the beginning of theories that result in technological ances; however, in order to adopt doctrinal thought as a belief t it is the best way to employ military force, doctrine itself t be constrained by realities. At the same time, that doctrine t be constantly reviewed, because rapidly advancing technology can rcome constraints of physics, making today's impossibility orrow's reality. This is an important concept for the strategist.

The starting point for developing military strategy objectives a specific arena is a hierarchy of strategy documents that ensures nity of purpose at every echelon. The highest level of strategy, nd strategy or national strategy, is described in a document led The National Security Strategy of the United States. The four ic tenets of this strategy are: (1) survival of the United States a free and independent nation with its fundamental values intact; a healthy and growing national economy to ensure opportunity for ividual prosperity and resources for national endeavors; (3)

healthy, cooperative, and politically vigorous relations with allies and friendly nations; and (4) a stable, secure world with flourishing political and economic freedom, human rights, and democratic institutions. (14:3-4) The President has several instruments of power available to him to achieve these four broad national security objectives, including political, economic, and military power.

The National Military Strategy translates the four broad national security objectives into more specific military objectives that guide theater commanders in developing their respective theater strategies. Theater strategies ensure that any application of military power is consistent with policy and supports national objectives.

In support of the first broad national interest--the survival of the United States--the National Military Strategy names these objectives: (1) Deter or defeat aggression in concert with allies. (2) Counter threats to the United States, its citizens and interests, short of armed conflict. (3) Promote regional stability through arms control agreements, modernizing deterrent and conventional capabilities, and developing defensive systems against limited ballistic missile strikes. (4) Foster global military spending restraint and discourage military adventurism. (5) Prevent the transfer of militarily critical technologies to hostile countries, particularly of chemical, biological, and nuclear weapons and associated delivery systems. (6) Stem the flow of illegal drugs.

In support of the second national interest--a healthy and growing economy with individual and national economic opportunity--the National Military Strategy calls for ensured access to foreign markets, energy, mineral resources, the oceans, and space.

The National Military Strategy supports the third national interest--healthy international relations--with two objectives: (1) Strengthen and enlarge the commonwealth of free nations committed to democracy and individual rights; and (2) strengthen the effectiveness of international institutions promoting peace, order, and progress.

Two additional military objectives support the fourth national interest--a stable and secure world where freedom, human rights, and democracy flourish: (1) Maintain stable regional military balances to deter aggression; and (2) aid in combatting threats to democratic institutions from military aggression, subversion, terrorism, and drug trafficking. (6:5)

In addition to the guidance contained in various documents within the hierarchy of strategies, another influence on strategy in the leadership category is policy. Although not a topic that students of professional military schools study in great detail, policy is an important consideration when developing a strategy, and it is even more important for senior leaders to understand that their policies can affect strategy in a very large way.

What is policy? According to Webster, it is "Wise, expedient, or prudent conduct or management; a principle, plan, or course of action as pursued by a government, organization, individual, etc." (11:1131) From a military commander's perspective, policy is the means he or she employs to exercise prerogative of command in areas not otherwise governed by specific regulation. Through policy the commanders at each echelon provide direction, vision, and leadership to the organization. Thus, strategy may incorporate national policy, defense policy, service policy, command policy, and organizational policy, depending upon the level of strategy being developed. Policy changes are a major concern for strategy makers, and such changes often accompany a change of leadership. For example, national policy is largely set by the President, and this can change every 4 to 8 years with a new President. The new leader may wish to focus on a different priority than the previous administration, and the effects of change pass to each subordinate echelon.

Similar to strategy development, many factors also influence the formulation of policy. Some of the more significant influences on military policy include doctrine; national interests; the political climate; the economic climate; military capabilities; the vision, judgment, and focus of the leader; the collective wisdom of the leader's advisors; organizational goals; national and international law; treaties; and resource constraints.

At the direction of the President, a national space policy was developed under the auspices of the National Space Council chaired by

the Vice President. The policy, articulated in a document called National Space Strategy, outlines five major objectives for United States space activity. They include: (1) Developing space launch capability and supporting infrastructure as a national resource; (2) opening the frontiers of space through both manned and unmanned exploration; (3) using space to solve problems on earth from national security to environmental protection; (4) generating economic well-being and national competitiveness; and (5) ensuring freedom in the use of space. (10:7)

Air Force space policy was set forth in a letter dated 2 Dec 1988 signed by then-Chief of Staff of the Air Force General Larry D. Welch and then-Secretary of the Air Force E. C. Aldridge, Jr. The tenets of Air Force space policy were stated as follows:

> - Some day, space power will be as important to warfare as air power is today.
> - We must be prepared for the evolution of spacepower from combat support to the full spectrum of military capabilities.
> - The Air Force will make a solid corporate commitment to integrate space throughout the Air Force. (3:--)

The third major category of strategy-influencing factors is resources. The most obvious resource is budget since that largely determines many of the other resources such as force structure, infrastructure, and technology. Senior leaders in the armed services never forget the source of funding for implementing the strategies they develop: the American people as taxpayers, and Congress as the overseer of those funds. The space community must accurately and

convincingly convey to them the importance of space power to national security--militarily, economically, and politically.

Force structure is another vital resource with major influence on strategy. Several essential elements of force structure include manpower, equipment, logistics support, and leadership. In order to effectively function with constrained budgets, emphasis must be placed on quality. Quality manpower requires quality training. Quality equipment, particularly the application of leading technology, has been one of our greatest national strengths and contributed significantly to the relatively low number of allied casualties during Desert Storm. The ability to quickly and efficiently move people and equipment anywhere in the world and sustain them for extended periods through a quality logistics system is equally essential, and quantifying that logistics capability is critical to any strategy. Quality leadership at all echelons, though not easily quantified, can make the difference in a strategy's success or failure.

Infrastructure is another absolutely vital national resource. Without an adequate industrial base, lines of communication, and transportation systems, military capabilities cannot be developed or sustained. Space capability requires an infrastructure of research and development centers, manufacturers, launch facilities, a space transportation system, mission control and satellite control facilities, and extensive communications networks.

A fourth factor influencing strategy in the resources category is technology. The phenomenal pace of technological change creates a most significant challenge for military strategists trying to stay abreast of new developments. Scores of historical examples prove that the nation that can adapt its strategy to fully exploit available technology has a decided advantage over its foes. The President's National Space Strategy will greatly enhance technological advancement in a number of areas that will benefit the defense community. By encouraging growth and exploration in the private sector, spin-off technologies should increase.

We must find ways to ensure open communication between the research and development community and military planners. Operators and planners need to identify valid operational requirements in order to focus research and development efforts and justify necessary budget expenditures, and the scientists and engineers need to inform operators and planners of the most current technological innovations so they can determine their potential for practical application. This process has been greatly suppressed in the area of space technology because of the heavy security classification of many space capabilities. Classification is crucial, both to prevent an enemy from exploiting friendly vulnerabilities, and to prevent him from learning about his own vulnerabilities that offer opportunities for exploitation. On the other hand, failure to inform our own warfighters of a capability may prevent our taking full advantage of it.

The will to win, both on the part of the individual and the nation as a whole, must also be included in the list of resources affecting strategy. In an address to the Air University in 1991, President Bush spoke of this factor and its influence on the outcome of Desert Storm: "But our victory also showed that technology alone is insufficient. A warrior's heart must burn with the will to fight. And if he fights but does not believe, no technology in the world can save him. We and our allies had more than superior weapons: we had the will to win." (4:2) National will is equally important to the developmental and operational strategies for space. Space systems are inherently expensive, and if individual taxpayers are not made to clearly see the importance of space power to national security, their Congressmen may be unwilling to approve adequate funding to support the development of space power capabilities. Strong and visionary leadership from senior decision makers can inspire a nation to great endeavors like putting a man on the moon, but unlike that program, we must ensure that future space programs support national interests to a much greater degree in order to justify the investment, and that is a very achievable goal.

Another promising resource that could affect space strategy is the cooperative support of allied nations in developing, deploying, and employing space assets, but this resource could be a two-edged sword. The proposition is attractive from a budgetary standpoint. With other nations helping to share cost burdens, each contributing coalition member could derive benefits from space assets that no single nation could afford. Furthermore, working together toward

common goals could forge stronger bonds of friendship and reduce the likelihood of future conflicts. On the other hand, such close cooperation could increase the risk of technology transfer to future competitors or enemies if diplomatic relationships deteriorated. Obviously, before such alliances are put into effect, each member would have to closely weigh the costs, benefits, and concerns. Each should consider how their requirements would change from peacetime to wartime and come to agreement on how operational decisions are made. Closely related to the prospect of cooperative ventures with allies is the ability to integrate resources with friendly forces. Even if individual space assets were owned and operated by a single nation, a capability to join together assets for mutual benefit could greatly enhance coalition efforts when required.

While resources have a dramatic effect on the development of strategy, the fourth category of strategy influences may be even more significant. This category includes environmental factors. The operational environment includes threats and the realities of the operational environment imposed by resource constraints.

The perception of the threat has long been one of the leading determinants of strategy. For more than four decades, the United States recognized the Soviet Union as the major threat to its national interests. It had the only nuclear force that threatened the survival of the nation, and its massive conventional force posed a major threat to Western Europe. Furthermore, it possessed not only an extremely robust military and civilian space program, but also the

world's only operational anti-satellite capability. These massive war-making assets coupled with its Communist ideology and open ambition for world domination gave the United States Department of Defense ample justification for developing and maintaining a credible deterrent force that included its space assets.

With the fall of the Soviet Union and its highly visible threat, the dilemma facing senior military leaders is convincing Congress that a more nebulous but equally dangerous threat to vital national interests may emerge, beginning an era that promises to be marked by intense regional conflicts erupting with little or no warning, and possibly employing high-tech weaponry. In a multipolar world becoming more and more interdependent, these regional conflicts increase the likelihood that US interests may be threatened. Furthermore, countries with a propensity for aggression that are constrained by fear of US intervention may become emboldened if they perceive US military power declining. Given the fact that force structure is being reduced significantly, it is imperative for the services to rely heavily on force multipliers--those systems that increase combat effectiveness and reduce manpower requirements. Space assets proved to be tremendous force multipliers during Desert Storm. Lieutenant General Thomas S. Moorman, Jr, now vice commander of Air Force Space Command, called that conflict "a watershed event in military space applications because, for the first time, space systems were an integral part of terrestrial conflict and were crucial to its outcome." (5:32)

While it may be difficult to identify a specific hostile nation with a capability to threaten vital national interests, several nations have space launch and on-orbit operational capabilities. Other nations are developing such assets. Knowing how long it takes to design, develop, produce, test, and deploy space systems, can we afford to wait until a specific threat suddenly appears to begin the lengthy acquisition process? Given the growing dependence of our terrestrial forces on space assets, the answer to this question must be "No!" Without knowing who the next enemy will be, or what capabilities he may have to threaten friendly space assets, what kind of capabilities should the United States develop?

Perhaps the most logical solution is to perform a threat analysis that focuses on space asset vulnerabilities rather than a specific enemy threat. Since all space systems have certain common characteristics, generic vulnerabilities can be examined to avoid the security classification problems associated with discussing specific system vulnerabilities. A space power strategy could then address the defense of friendly vulnerabilities and the targeting of hostile vulnerabilities.

With few exceptions, almost every space system includes the following components:

First, there is a space platform. This could be a satellite, a space vehicle, or a space station. The platform itself may be nothing more than a vehicle for carrying one or more mission

packages. If the platform is disabled or destroyed, the mission package cannot be maneuvered.

The second common component is the mission package itself. This is the true heart of any space system, its reason for existence. The mission package does not have to be destroyed to be rendered ineffective. If it is in a low earth orbit where it passes over a strategic location periodically, it could be disabled only as it passes over that area, perhaps through electronic warfare techniques.

An age-old military strategy has been to interdict enemy lines of communication while protecting friendly lines of communication. All space systems have lines of communication and several critical nodes along those lines could be vulnerable. The third component, then, is the data stream over which mission data is passed from the mission package, and command and control data is passed to both the mission package and the space platform on which it rides. Disrupting this communications path would defeat the system.

The fourth common component of a space system is another element in the line of communication--the data-receiving ground station. This receiving station could be a single facility or a proliferated network of receivers located on land, aircraft, surface or sub-surface ships, other spacecraft, or perhaps one day even on extra-terrestrial surfaces such as the moon.

The fifth common component is the command and control node for the space platform. This is often a different facility from the data-receiving ground station. It is from this facility that commands are directed to the spacecraft to maneuver it. Disabling the ability to control the platform would soon impair the capability of the mission package.

Other critical points not usually associated with the space system itself are the mission data command, control, and communications nodes. In order for space mission data to be useful, it must be communicated from the data-receiving ground station to a decision maker or warfighter. If that portion of the communications path were cut or disrupted at a critical time, it would have the same effect on the warfighter as destroying the space asset itself.

Three other components that, if lost, could have a longer-term impact on a space system are elements of the space program's supporting infrastructure. The launch vehicle by which replacement satellites are placed in orbit is one vulnerability so tragically demonstrated by the Challenger accident. Assured access to space is critical to all space capabilities. Closely associated with the launch vehicle are space launch facilities. A catastrophic accident or attack on launch facilities could also deny a nation access to space. Another vulnerability in the area of infrastructure would be the manufacturing facilities where spacecraft are produced or assembled. Destruction of such critical facilities could have significant long-term effects on a nation's space capabilities.

Another step in analyzing the threat to space assets is ·termining the possible sources of threats. Due to the global or ıiversal nature of the deployment capabilities for space assets, a ıreat could come from almost anywhere. Sources could include .tacks from land, air, surface and subsurface ships, orbital ıace-based assets, and even extraterrestrial-surface-based assets.

Developmental strategy for space power must address the defense each of the vulnerable areas from each of the possible sources of ıreat. It should also consider how best to exploit or defeat enemy ılnerabilities to deny him the use of his own space assets.

A final major influence on strategy is constraints. The most ıvious of these is inferior resources to those of the enemy. This lemma confronted the United States in dealing with the nuclear senal of the Soviet Union when we went from the only nation with ıe atomic bomb to a situation where we were greatly out-numbered in ıclear weapons and delivery systems. The resulting strategy was a ·avy reliance on technological superiority and the mind-boggling ·terrent strategy of Mutually Assured Destruction.

There are other less obvious constraints that also influence .rategy. One is poor doctrine. If what we believe to be the most fective way to conduct military operations leads us to develop a ·rtain force structure, and that belief turned out to be grossly ·ong, the nation's very survival could be seriously threatened. The

ought of this situation weighs heavily on the minds of the senior adership responsible for national security. Since doctrine, like rategy, is influenced by many factors, it is important to derstand those factors and their ramifications to the greatest tent possible. Examples of constraints that could affect the velopment of doctrine and strategy include an inaccurate assessment the threat and an inaccurate prediction of the future. Similarly, ck of experience, misinterpretation of history, misapplication of ssons learned, and poorly defined objectives could have an equally gative influence on doctrine and strategy.

Still another constraint on strategy is policy prohibitions. An ample of this kind of constraint occurred during the development of e ASAT system. Our space control doctrine indicated that we should velop a means to protect our space assets and to have the pability to deny an enemy the use of his own space assets. The viets believed very strongly in this doctrine themselves. They veloped, and successfully tested their ASAT system before the ited States could complete the testing of our own ASAT. The viets then declared a moratorium on ASAT testing, and Congress ssed a similar ban, leaving our country with no ASAT capability. us, policy decisions can have a great influence on developmental rategy.

This examination of some of the major influences on force velopmental strategy for space power suggests a number potential als. First, force developmental strategy needs to support the

employment strategy for space power to develop an adequate force structure. Likewise, the strategy should incorporate military and space environmental and organizational doctrine. In that regard, the strategist must apply lessons learned from Desert Storm and similar operational experiences. Foremost from that experience is the realization that space assets must be made more responsive to support tactical combat forces. This will require greater exchange of information between operators and research and development personnel to ensure operational requirements are identified to engineers and new technical capabilities are made known to operators and planners. Similarly, efforts must be made to overcome security classification barriers between the operations and intelligence communities. Another doctrinal issue concerns the current space control doctrine. With the growing dependence of combat forces on space assets, it is just as vital in combat to be able to control the space medium as it is to maintain air superiority. If an enemy were to gain control of space, our ability to communicate, navigate, gather intelligence, and protect our ground forces from attack could be placed at extreme risk. In spite of this knowledge, we still do not possess a system capable of gaining or maintaining space superiority. This shortcoming needs to be corrected.

In the area of space support, we need a cheaper and more efficient propulsion system to assure continued access to space, particularly in this period of budget reductions. We should pursue creative ways of stretching our space budget dollars through such possible means as joint ventures with civilian firms and allied

nations. We must also ensure Congress understands the importance of space power to our national security and that a threat still exists even though the Soviet Union is breaking up. We must emphasize quality in every aspect of force structure from personnel training to system procurement and logistics support. With a reduction in force, quality becomes paramount. At the same time, we must continue to develop and expand a sound infrastructure to support space research and development, launch capabilities, and on-orbit support. This is an investment not only for now but also for the future. Technology has long been one of this nation's greatest assets, and we must continue to invest in the educational and research and development facilities that will maintain our lead in this area. As stated before, we should expand our efforts to involve operators in the identification of requirements and the exploration for operational applications of new technologies.

In the absence of a specific hostile enemy that immediately threatens national interests, planners should conduct an extensive analysis of space system vulnerabilities to develop defensive strategies and tactics as well as technical requirements to improve survivability. At the same time, strategists need to look at the same vulnerabilities from a space control point of view in the event a military force application ever becomes necessary.

Above all, the American people and their elected representatives must be educated on the importance of space power to our national interests. Without their support, the nation cannot remain a

spacefaring nation. We must develop a vision for the future. In this century we have gone from horse and buggies to moon rovers. The technologies that are emerging such as supercomputers are accelerating the technological advances to such an extent that it is difficult to predict what wonders lie in the near future. "Shooting for the moon" used to mean striving for an impossible dream. Now with the President's Space Exploration Initiative, the moon is only an intermediate goal on the way to Mars. Space holds the promise of vast, untapped resources and possible solutions for some of earth's most difficult problems such as over-population. History indicates that civilizations have always sought to explore and colonize new shores, and perhaps space is another great sea waiting to be voyaged. Whatever the future holds, space power has become vital to our national security interests today, and we must be wise in building a developmental strategy to assure our ability to protect those interests.

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